Designing a Multihop Routing Protocol

TA Section #4
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Goal of Homework

- Freely design a multihop routing protocol
- Think of cases that can happen when a network is multihop and address cases that can potentially arise
- Test protocol in various environments
Multihop
Multihop Routing

• What route should a node take to reach destination node?

• Many routes can exist and typically one route is selected
Different Types of Multihop Routing Protocols
Any-to-any Routing

• Any node has a route to reach any other node in the network

• Routing information can be local or distributed
AODV

- On-Demand (reactive) protocol
  - Use RREQ packets to find out routes when needed
  - Nodes respond to RREQ packets with RREP
  - This message exchange ‘reveals’ the route to a destination
  - End-to-end path is secured before transmission
DSDV

- Routing table based protocol
  - Make routing table using packet exchanges with neighboring nodes
  - Propagate neighbor information for routes
  - Route update requires significant overhead
  - Ensure that there exists an end-to-end path to the destination before transmitting
Tree Routing

- CTP
  - Single destination (root of the tree)
  - All nodes keep track of their next hop node to reach the root node
  - 4 bit LE (discussed in class) is used to determine good quality links
Source Routing

- Can be combined with tree routing to achieve packet delivery to any nodes in the network
Source Routing

1 2 3 4 5 6

6 PAYLOAD
Source Routing

1  2  3  4  5  6

5  6  PAYLOAD
Source Routing
Source Routing

1  2  3  4  5  6

3  4  5  6  PAYLOAD
Source Routing

1 2 3 4 5 6

2 3 4 5 6 PAYLOAD
Source Routing
Consideration Points

• Loop
  • Source sends a packet and after a ‘few’ hops the same packet comes back to the sender
  • You can NEVER reach your destination when loops occur
Consideration Points

• Link Selection Metric
  • Hop count
  • LQI
  • RSSI
  • ETX
  • etc...
Consideration Points

• Packet Reception
  • High delivery ratios are desirable
  • Routing protocols such as CTP have hop-by-hop retransmissions to assure that the packets are not lost on the route to the destination
Consideration Points

• Dynamic Path Updates
  • Paths can change dynamically
  • Should not fully rely on a single link at all times
Skeleton Code

• Forwarding Engine

  • Receive packet from application and send the packet
  
  • Query routing engine for next hop node
  
    • The application layer just specifies where it wants the packet to be delivered to and this destination is queried using the forwarding engine - routing engine calls

    • Insert routing headers that include final destination information or even expected route information
Skeleton Code

- Routing Engine
  - Keep routing related information
  - Neighbor table
  - Link quality statistics
- Return next hop information to forwarding engine or entire route information to reach destination node
Give me...

- Code
- Documentation
  - Details on implementation
  - Answer the questions on the homework specifications (any clarifications?)